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Chemical Composition Of Florida Citrus Soils

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During the spring of 1937 a survey was made of one hundred groves located in the various citrus areas of the state, from which over two hundred soil samples were collected, representing all of the major soil types commonly planted to citrus in Florida. The survey was undertaken primarily in an attempt to arrive at the relative fertility of the various soil types on the basis of the exchange capacity, exchangeable bases, readily available phosphorous and nitrogen, and to determine some of the underlying factors which might affect their management with reference to fertilization and other cultural practices. While it has been generally conceded that certain soils planted to citrus are more fertile than others, relatively little systematic information is available in regard to the magnitude of the differences among the various groups of soils and the extent of variation within any one group or series. Such information is necessarily basic to all research on citrus soils and should have an important bearing on our present fertilizer practice and soil management.

At the time the samples were collected careful notes were made on the condition of the grove by Mr. Walter Reuther of the Citrus Experiment Station staff. Detailed data were also taken in regard to the past fertilizer practice, liming and other soil amendments insofar as the records were available. Although the results of soil analyses obtained thus far have given us a better understanding of some of our soil problems and will, no doubt, continue to prove their usefulness in the formulation of our future soils research work, it is believed that the information compiled to date is insufficient and would hardly warrant any attempt at far-fetched correlations of the results of soil analyses with the grove condition.

A given soil condition may be considered more static than the grove condition inasmuch as soil analyses represent definite values at the time of sampling, while the grove condition is subject to greater fluctuation and is often the reflection of a previous rather than the current soil condition. This has been accentuated in the present situation by the fact that many of the groves had received applications of dolomite a relatively short time before the soil samples were taken and in most instances the response to the dolomite had not been noted in the trees. In this study, therefore, the tree condition becomes a variable that will have to be studied in greater detail for a longer period of time in order to establish any definite correlations. This paper is primarily an attempt to give growers and others interested in the citrus industry a clearer picture of the soil itself, a viewpoint that has been extensively overlooked in citrus in Florida.

A brief description of the soils presented in the table is given for the benefit of those who are not familiar with soil classification. A more complete description of the various soils in the state may be found in the Soil Survey Reports or in Bulletin No. 42 of the Florida Agricultural Extension service.

Norfolk soils represent the well drained undulating to rolling pine and black-jack land. They are characterized by about 4 to 6 inches of gray to dark gray loamy sand underlain by a yellow sand which passes into compact sandy clay beds at varying depths below the surface. These soils grade from a coarse sand (Norfolk sand) containing very little organic matter, commonly called "black jack" land, to a much finer loamy sand (Norfolk fine sand), the surface layer of which is gray to a dark gray having a higher content of organic matter, and frequently referred to as "high pineland." Some of the better Norfolk soils have a hammock or predominantly hardwood growth. The Norfolk soils are by far the most extensive citrus soils in the state having been planted extensively during the heaviest development of citrus and constitute at the present time at least sixty per cent of the total acreage.

Blanton soils occupy lower areas or depressions when in association

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1. Agricultural Research
2. Citrus Fruits, By Products

The Chemist Looks At The Citrus Products Industry In Florida *

BY HARRY W. VON LOESECKE,
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Winter Haven, Fla.,
at Meeting of Florida State Horticultural Society

Ten years ago, C. P. Wilson of the California Fruit Growers' Exchange, in speaking of the relation of chemistry to the citrus products industry, said, "The task of the cnemist is to develop new products, to supervise and control the manufacture of such products and to develop outlets for them. A very important function is to sell chemistry to . . . grower owners of the products companies and keep it sold." The chemist has done well his task of selling chemistry to the California citrus grower: citrus by-products made by the Exchange are sold throughout the world. Indeed, the California citrus grower has become so thoroughly sold in chemistry that he is today shipping frozen orange juice to Nassau just off the coast of Florida, and concentrated orange juice into Florida where it is sweetened with sugar, diluted with water and sold as so-called "dairy orange juice."

Why not let the it be the task of the chemist in Florida to sell chemistry to the citrus industry of this state? As a step in this direction, many of the more progressive canners are now employing either full or part-time chemists for research and to control and standardize their products. Others are employing consulting chemists. This practice was almost unknown as little as three years ago.

Six years ago the Federal government established a laboratory at Winter Haven to investigate the utilization of citrus fruits unsuitable for fresh fruit market because of size or color, and to devise means for recovering by-products from cannery waste. It is the purpose of this paper to review the work of this laboratory, and point out some of the problems yet unsolved and towards which research should be directed.

The most important problem was to find some means of packing orange juice so that its aroma and flavor would be wholly retained during a storage period of nine months to a year. In this we have been partially successful, for by proper extraction, deaeration and flash pasteurization and storage in enamel cans at temperatures of about 60° F., the juice will remain palatable for periods as long as nine months to a year (1). It is admitted it does not have the full aroma and taste of juice from fruit just picked from the tree, but it is a product which would be acceptable to a majority of people not familiar with fresh orange juice as we know it here. That deareation and flash pasteurization are a distinct improvement over the older exhaust box method of processing both orange and grapefruit juice is attested by Florida canners themselves who are now installing such equipment, and by the fact that the packing of orange juice is increasing. Long before this method was utilized in Florida it was being used by the citrus canners in Texas and California. During the course of our work a new type of deaerator was developed which is cheaper to construct than other equipment of this type on the market (2).

The reason why canned orange juice assumes off-flavors during storage has produced many theories and much speculation. It is quite certain that oxidation due to the oxygen in the air left in the juice after canning plays a role in off-flavor development. But no one knows how much air or oxygen is necessary to bring about these changes. In fact no one has ever published the results of determination of the amounts of the different gases (carbon dioxide, oxygen and nitrogen) in freshly reamed and deaerated orange juice. Nor has anyone published data on the gases in canned citrus juices of different ages. At the present time, the Federal laboratory is conducting research of this nature.

If you will look in tables indicating the nutritive values of different food materials, you will find that the edible portion of oranges is said to contain 0.2 per cent fat. This is an extremely small amount, but may have some bearing on the development of off-flavors in canned juice. When fats undergo certain chemical changes they are split into other bodies some of which may have a very objectionable odor and taste. From our preliminary work on the free acids of the fat of orange juice we have found these acids are much higher in old canned juice than in freshly expressed juice. It should perhaps be pointed out these fatty acids should not be confused with the citric acid. This change in free fatty acid content may be of significance and further work is being carried out with the view of determining the nature of the fat in orange juice. The results may not only be of importance in solving the riddle of off-flavors in canned orange juice, but perhaps will contribute to a better undertsanding of the nutritive value of orange juice.

During the past few years the production of cold-pressed orange and grapefruit oil from peels has increased. Many producers soon learned they had difficulty in disposing of some batches of their orange oil because they would not meet the U. S. P. requirements. When this was discovered there was much wailing in the fold and talk that California had stuffed the Pharmacopoeia so only California orange oil would meet the specifications. California is innocent. Not every batch of California orange oil will meet the U. S. P. specifications, but each batch is tested and by careful blending and control of quality the oil not only meets the U. S. P. standards but occupies an important place in the world supply. To learn the variations of Florida orange oil from U. S. P. standards, the laboratory at Winter Haven has requested different manufacturers of oil in the state to gather samples during the year so that we may examine them. At the present time, orange and grapefruit oil are produced in Florida either by grinding the peels of the fruit, or by passing the peels between revolving ribbed drums. In both methods an emulsion is obtained from which the oil is separated by means of centrifuges. An important point here,

*Food Research Division Contribution Number 378.

and which all manufacturers of citrus oils in Florida may not recognize, is that the emulsion cannot be allowed to stand for any length of time before the oil is separated, without impairing the flavor of the oil. The manufacturer of orange oil in Florida does not attempt to blend his different batches to obtain a uniform product, nor does he apply technical control.

After the peel has been pressed as described, there is still some oil left which can be recovered only by steam distillation. The yield of steam distilled oil is higher than cold pressed oil. Steam distilled orange oil is lower in price than cold pressed oil and finds uses where a cheaper oil is desired. Large amounts of steam distilled orange oil are produced in California, but none is being made in Florida, although it could be.

One day about two years ago a man called at the laboratory to ask what we knew about the oil in grapefruit seeds. We showed him the results of our laboratory work and today in Winter Haven there has been established a small plant for extracting the oil from the seeds. Briefly, the method consists of subjecting the seeds to a short fermentation to loosen the slimy coating, drying to the proper moisture content and then expressing the oil. The oil is expressed by means of automatic expellers and the oil obtained allowed to settle and then clarified by pumping through plate and frame presses. The oil thus obtained is light amber in color and possesses a pleasant aroma and a bitter taste. The bitterness may be removed by proper refining which at the same time bleaches the oil until it is nearly water white. The preparation of grapefruit seed oil yields two products: the oil and the press cake. The true properties of the press cake and its industrial possibilities have not yet been investigated.

About three years of research were spent at the laboratory on the chemistry and preparation of alcoholic beverages from citrus fruits (3). This work has now been stopped. In the fiscal year ending June, 1937, 24,886 gallons of still wine were produced in Florida. Whether the industry will become of importance in the state is a matter of economics.

Feeding tests by Mead and Guilbert of the University of California Agricultural Experiment Station 12 years ago showed orange pulp to have a high content of digestible nutrients (4). The drying of orange peel and pulp was carried out in California ten years ago (5). Recent work by Neal, Becker and Arnold (6) of the University of Florida Agricultural Experiment Station has shown the value of grapefruit cannery refuse and dried orange peel as a feed stuff. The dehydration of cannery residues has now become an important industry in Florida. It has shown a method of disposing with some profit of a material which was formerly an expense and nuisance. But in eliminating one nuisance another has unfortunately been created. This is the liquid pressed from the material prior to drying, the disposition of which has caused public health authorities some concern. The quantity of the liquor may amount to from 20,000 to 50,000 gallons per day. A partial analysis of this material is shown in Table 1. From this table it may be seen the waste liquor contains a significant amount of solid matter, including sugars, which subsequently ferment creating obnoxious odors. The material is so concentrated it defies ordinary sewage treatment practice. At the present time it is being disposed of by lagooning which may be considered as only a temporary solution. Some is also being disposed of by trucking away in tanks. It can be readily seen this method is one of great expense. It is not entirely impossible the waste could be fermented with special organisms, not to recover alcohol, but to obtain certain organic acids of technical value. This problem is now being investigated by the laboratory at Winter Haven.

Another situation of public health significance and of great importance to the canning industry in this state is the disposal of the wash waters from the canneries. These washings contain sugar, pectin and other organic materials which are allowed to flow into lakes. Organic matter is oxidized by Nature so that it may be changed to more stable compounds. The oxygen to carry this out is obtained from the water in the lakes and when this oxygen is consumed there is no longer enough available for fish life. This condition has occured in some instances in lakes on the shores of which canneries are situated. With the cooperation of the Florida Canners' Association, who have provided funds to erect a small treatment plant, and the Florida State Board of Health, work has been started at the Winter Haven Federal laboratory to find some method of treating the waste so it may be disposed of without becoming obnoxious and without danger to wild life.

Another problem upon which we have been working is the bacteriological aspect of the canning of citrus juices. We have already made several bacteriological counts of raw juice and pasteurized juice in different canneries. Various yeasts, molds and bacteria have been isolated, but have not as yet been identified. Work of this type has been extensively pursued and found valuable in tomato juice production and there is no reason why it should not prove equally valuable in the canning of citrus juices.

Let us now turn to problems which should be attacked but which we have been unable to undertake because of limited funds and personnel of the station:

The question of preparing pectin from grapefruit residue has been a much disputed topic. Vast amounts of pectin are prepared in California by the Exchange, and large quantities are manufactured elsewhere in the country from apple pomace. Nevertheless, during the past year there has been increased interest in this subject as related to the citrus products industry in Florida. It should be realized that the manufacture of pectin requires the highest type of technical control and this means high manufacturing costs. Pectin finds its greatest use in the preserve and confectionery industries. To increase the demand for pectin new uses must be found. Recent work in Germany has direct-

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1. Plants 2. Soil moisture

HOW PLANTS FEED

Absorption Of Plant Foods In Relation To Soil Moisture . . .

MAJOR EDWARD T. KEENAN
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When there is a supply of available moisture in the soil, it is well known that a plant can absorb the water and leave the greater part of the dissolved salts (plant foods). Likewise, a plant can absorb the plant foods from such a soil and leave most of the water.

A soil particle in place is never thoroughly dry, but is always surrounded by a film of moisture. This film may be microscopicly thin and held there by the force of adhesion equal to the pressure of several thousand atmospheres. This enormous force, holding the water to soil particles when the soil moisture is even below the wilting stage, and prohibiting the plant from obtaining its necessary water, is not a force great enough to prohibit the soil's giving up to the plants necessary nutrients.

Considering that the absorption of water by a plant and the absorption of nutrient elements are two separate phenomena, we must conclude that the absorption of nutrients is not a matter of osmosis because osmosis concerns movement of solutions only. Neither can it be absorption of dyalysis, because dyalysis is the separation of different substances in solution by difusion through a moist membrane, but neither molecules nor ions can be absorbed from a relatively weak soil solution into a relatively concentrated solution such as a plant sap, by a process of dyalysis. Consequently, it must be a form of interchange of electrical charges.

We all know how one metal is deposited or electrically plated upon another substance. We all know something about the action of a storage battery and that the solution in the battery is called an electrolyte. The soil is one big storage battery or plating factory. The soil solution is an electrolyte.

Effect of pH

A compound is a collection of elements. When an element takes on an electric charge, it is known as an ion. When a compound (any fertilizer material, organic or inorganic) is dissolved in soil moisture, it breaks down into its component parts or elements, and these elements ionize (take on an electrical charge). Plants absorb their nutrients as these ions or electrically charged elements. For example, if we add Calcium Nitrate to a soil, the plants absorb the Calcium ion and the Nitrate ion separately, and not the salt as a whole.

Plants can remove their nutrients (ions) from the soil without removing water because the ions move through the water according to their electrical charge, positive ions attracting negative ions, and repelling other positive ions. Acid conditions favor the negative ions and alkaline conditions favor the positive ions.

A plant root is never in direct contact with a solid soil particle, because of the moisture film. According then, to the ionic theory a plant can remove nutrients for a considerable distance, provided there is a water-way connection. Remember, the water does not have to move or flow. The ion moves through the water the same as in electric metal plating.

When salts are dissolved in soil water, they separate into their component parts or ions, each ion carrying either negative or positive charges of electricity. When the pH of the soil is high, or in the presence of residually alkaline fertilizers in alkaline soils, the plant has considerable difficulty in absorbing sufficient of the positive charged ions (Calcium, Potassium, Magnesium), and when the pH of the soil is low or acid, the plant has difficulty in getting the negative charged ions.

Positive Ions (Cations)
Excessive absorption from alkaline soil solutions

Potassium, Sodium, Calcium, Magnesium, Manganese, Iron, Aluminum, Ammonium, Boron, Hydrogen.

Negative Ions (Anions)
Excessive absorption from acid soil solutions

Chloride, Sulphate, Nitrates, Phosphorus, Silica.

Some causes for "tree decline" may be traced to this hypothesis, thus: The pH of the root sap of citrus trees varies from time to time, depending upon what the roots have absorbed from the soil solution. However, the pH of the sap of the branches and leaves is always quite constant, but differing in each variety. Hence, a root will absorb different ions, (positive or negative) according to the pH of the root sap and soil solution, but the pH of the upper part of the tree may be different, and the movement of the proper ions upward from the roots cannot take place. Consequently, a tree will go into decline for want of proper nutrients even though they are in solution in the soil. The effect of this out-of-balance condition may not be visible in the tree for several months or even years.

Fit this in with different root stock, variety of top; acid, lemon or lime; not so acid, orange or tangerine; medium, grapefruit.

Transfer this line of reasoning from different root stock and top variety to different soil conditions.

Is not the answer here to some perplexing problems?

Planting of fruit trees and huckleberry plants for the home fruit orchard has been stressed in the Taylor county home demonstration program during the past few weeks, according to Miss Floy Moses, home agent.

CHEMICAL COMPOSITION OF FLORIDA CITRUS SOILS

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with the Norfolk soils or slight knolls within and surrounding the flatwoods. These soils differ from the Norfolk soils in that the subsoil consists of a pale yellow with splotches of gray to a grayish yellow fine sand which at lower depths from 3 to 6 feet is underlain by sandy clay beds.

The surface layer of Eustis soils consists of 5 to 7 inches of a dark to grayish brown fine sand which is underlain by a light reddish-yellow to yellowish red fine sand. The subsoil rests on sandy clay beds several feet below the surface.

Lakewood soils have a surface of gray fine sand 4 to 6 inches in thickness grading abruptly into a white incoherent fine sand 8 to 20 inches thick. This is underlain by a yellow to orange loose fine sand which at varying depths rests on reddish mottled clay. Although the fertility of these soils is usually very low, they make satisfactory citrus land where the gray surface layer is 6 to 7 inches deep containing an appreciable amount of organic matter and the layer of white incoherent sand is only 4 to 8 inches in thickness. All of the three horizons just described are included in the Lakewood profile shown in the table. It should be noted that the exchange capacity of the white sandy layer, sample No. 239 is lower than that of the surface layer or the underlying yellow subsoil.

Orlando soils belong to a better group of well-drained upland soils called "high hammock" lands. The surface layer, consisting of very dark gray loamy fine sand ranging from 8 to 12 inches in thickness and very high in organic matter, is underlain by a dark gray loose fine sand which gradually becomes lighter in color with depth. This extends to a depth of about 5 feet overlying clay beds.

Although not planted extensively to citrus, Gainesville soils represent some of the most fertile hammock land in the state. The surface layer consists of brownish gray loamy fine sand underlain by a reddish brown sandy subsoil which is often quite loamy due to the presence of clay. These soils are derived from the disintegration of limestone mixed with deposits of sand and are underlain by limestone or coquina rock.

Parkwood soils are "low hammock" lands supporting a growth of cabbage palmetto, live-oak, magnolia and other hardwoods. The typical soil profile consists of a dark gray to almost black loamy fine sand 8 to 15 inches in depth overlying a gray and yellow mottled loamy fine sand which at 2 or 3 feet passes into a whitish marly clay. Since these soils are quite variable two different Parkwood soils are given in the table. Good groves are invariably found on soils having a profile similar to the one represented by soil samples Nos. 142 to 144 inclusive. The surface layer (sample No. 142) consists of 8 inches of dark loamy fine sand, underlain by 10 inches of dingy brown loamy fine sand (sample No. 143) which passes abruptly into a very plastic, slightly mottled yellowish clay (sample No. 144) about six inches thick resting upon marl and calcareous rock. The soil profile represented by samples No. 145, No. 146 and No. 157 is typical of the so-called "marl spots" which were found frequently associated with a certain grove condition to be described later. The soil profile as shown in the table consists of 6 inches of very dark to almost black sandy loam (sample No. 145) underlain immediately by a grayish to creamy white layer of marl (sample No. 146).

Portsmouth soils are perhaps the most extensive poorly drained soils in the state. The surface layer is a dark gray to gray sandy loam sand, 6 to 8 inches deep and very acid in reaction, underlain by a light gray to almost white sandy subsoil which at varying depths several feet below the surface passes into a heavy blue mottled clay. When properly drained the fertility of these soils, like that of most well drained soils, is very much dependent on the amount of organic matter in the surface layer.

Bladen soils make excellent land for citrus when properly drained. The soil profile as given in the table consists of 10 inches of dark gray loamy fine sand (sample No. 268) underlain by yellowish gray sandy clay (sample No. 269) containing appreciable amounts of clay which gradually becomes heavier and more plastic with depth and rests on bluish clay mottled in places with yellow and brown.

Soil samples were taken at approximately the periphery of the tree or the point of maximum leaf-drip by means of a stainless-steel tube 1½ inches in diameter. At least 12 borings were made, one boring to a tree, separating all well defined horizons to a depth of 18 inches. In most of the light sandy soils in which the profile is quite simple, samples were obtained at two different depths, the gray to black layer 5 to 7 inches thick being separated from the yellow, gray, or grayish-white subsoil. The subsoil sample was taken to an arbitrary depth of 18 inches. Both the surface soil and the subsoil borings were composited separately in the field and brought to the laboratory in quart Mason jars where they were air-dried, screened through a 2 mm. aluminum sieve and thoroughly mixed. The following analyses were made: Exchange capacity; exchangeable calcium, magnesium, potassium and manganese; organic matter; total nitrogen; nitrate nitrogen; phosphorous and pH.

The data presented in the table are typical of the results obtained for the various soil types, which are arranged in the order of their exchange capacities. The exchange capacity may be defined as the capacity of a soil to absorb and retain a certain group of plant nutrient elements or fertilizer materials, namely, calcium, magnesium, potassium, manganese, zinc, copper and ammonia, which are referred to as "exchangeable bases." The total quantity of the exchangeable bases any soil can hold is a fixed quantity that can be varied only with difficulty, and is determined by the amount of organic matter or clay present in the soil. The organic matter, or more correctly the "humus," constitutes the main source of colloidal material in the light sandy soils. Because of the small amounts of clay present, the inorganic soil colloids contribute very little to the exchange caapcity of many Florida citrus soils. This is substantiated by the ratios of the exchange capacity to the per cent of organic matter which remain quite constant despite the great variation of the exchange capacity and the amount of organic matter in these soils. The discrepancy noted in the last two samples is due to the presence of clay which tends to make the ratios higher. The organic matter content of a soil is thus a rough index of its exchange capacity, which in turn may be said to be a

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DROUTH APPARENTLY BROKEN

One of the most protracted and serious drouths which have affected citrus Florida was apparently broken by generous showers which fell upon most citrus sections on May 24 and 25. A similar drouth in 1922 was broken by rains on May 4. According to old timers, only the drouth of the fall of 1906 and the spring of 1907 equalled the one which has just been broken.

Loss to growers from droppage of fruit, injury to bearing trees and loss of some young trees is variously estimated at from $10,000,000 to $12,000,000, but this estimate must be in a measure discounted by the fact that had all the fruit set from the heavy bloom remained on the trees the enormous crop would doubtless have had its effect upon the price received by the growers.

Where growers were prepared to properly irrigate their groves the loss was comparatively light. Where irrigation was impossible, the loss to individual growers was extremely heavy. Pinellas county probably was the worst sufferer, estimates of the loss running as high as 15 to 20 per cent of the crop.

With the rainy season at hand and the June bloom still to be reckoned with, it would appear that there still will be an abundant crop of both oranges and grapefruit despite the drouth, and while individual losses may be heavy, the industry as a whole has suffered less than might have been anticipated.

DON'T NEGLECT YOUR GROVE

In times of drouth or flood, the wise grove owner does not neglect his grove. Fertilization, spraying and other cultural practices are as important, if not more important, at such times as under normal conditions.

Fertilizer prices are comparatively low. As compared with 1929, mixed fertilizers are 26.3 percent lower today than before the depression days, while the average of all commodities is but 16.4 percent below the 1929 level. At these prices, no grove owner can afford to starve his grove, particularly at this time when his trees are needing the maximum of plant food to help them recover from the conditions arising from the drouth.

Trees also should be given every possible protection against pest attacks and the ravages of disease. Any grove worth having is worth proper care — particularly in times of emergency.

ANY PRORATE SHOULD PROTECT GROWERS

One of the large shippers of the state in talking with a representative of this publication stated that he was in thorough accord with The Citrus Industry's long established and oft-expressed theory that a permanent marketing agreement of a workable sort must become effective before the growers of Florida can hope to secure adequate and satisfying returns for their fruit.

This shipper stated, however, that until an agreement was reached which gave absolute protection to the growers of the state the problem would never be satisfactorily solved.

It was the opinion of this gentleman that until a marketing agreement which provided an elaborate prorate based upon past performance was inaugurated, the problem would remain unsolved. "Any other sort of prorate control," he stated, " provides entirely too many loopholes for the shipper—loopholes which the majority of shippers will take advantage of in order to keep their operations on a parity with their competitors."

"Let this past performance prorate be put into effect," said our informant, "and eliminate all infringements upon it by the purchasing of additional tonnage under a current requirement clause, or in any other way and you will see the citrus grower getting the consideration he deserves."

Such a prorate as proposed, according to this shipper, should include a clause permitting growers to sell to different shippers in different years but to have the original volume of each shipper prorate remain constant regardless of such purchase.

The only other alternative according to our informant would be to grant the individual growers prorate quota which they would use up as they sold their fruit to the shippers.

We do not profess to be as well versed as the average shipper in the essentials of what makes a good marketing agreement, but we do agree with this shipper that until some arrangement is worked out which serves to give the grower primary consideration over everyone else in the citrus business, no marketing agreement will be basicly successful.

—And if the suggestion of this gentleman who is undoubtedly one of the best informed operators in the industry will turn the trick, we say, let's have it at the earliest possible moment.

It remained for a Canadian lady to discover that grapefruit juice is an effective eye lotion Most of us have used grapefruit juice as an eye-wash involuntarily, but the Canadian lady uses it regularly as an antidote for weak eyes, and she says, with most beneficial effects.

Citrus Fruits, Florida - North

Grove Conditions And Cultural Practices In The Northern Area

THOS. F. O'MARA, Oakland, Fla.
At Meeting of Florida State Horticultural Society

Groves in the northern area were, as you all know, subjected to very low temperatures in December, 1937. That freeze did considerable damage to fruit, but the damage to trees was relatively small. While it is true that some groves did get frozen and in a few cases young bearing trees were killed back to the bud union, yet on the whole, damage to trees was light.

Apparently the reason most trees withstood the freeze was that they were more dormant than usual due to the preceding cool spells and also to the fact that there had been good rains so that soil moisture conditions were unusually favorable.

In January of this year those trees which had been hurt by the cold put out a growth and this growth was killed by the low temperatures in February.

I have referred to the cold spells of this past winter because the grove conditions of today were influenced so much by those low temperatures.

There are some groves now in a very bad condition, but on the whole trees put out a splendid growth this Spring and the condition of trees was better than the average condition at that time of the year.

This winter did not bring to light anything that was not already known, but it did emphasize the value of having trees in good, normal health and as dormant as possible to withstand low temperatures. It also emphasized, to the sorrow of some grove owners, that it is a poor policy to have trees over-fed with nitrogen during the winter.

I have in mind some groves which had been so fed, especially with Nitrate Nitrogen, that they were ammoniated and to those trees — that which was to be expected actually happened. They were hit pretty hard in December and they came out early with a long, tender growth which the February cold got. However, the general picture of this Spring was excellent. There was a full flush of growth and a tremendous bloom.

The damage to Spring growth on bearing trees by aphis was light, but the population of mites of all kinds increased rapidly and in some groves considerable damage was done by red spider, six spotted mite, purple mite, while some groves have taken on a light cast similar to nitrogen hunger due to rust mite attacking the foliage. A statement is sometimes made that insects won't be bad following a cold winter, but that has not held true this year.

At the time trees were blooming many predictions for a bumper crop were made, but the prospective crop for 1938-39, as judged by the amount of bloom, has been cut down considerably by dry weather. At this time, the prospect seems to indicate a full, normal crop, but the dry weather continues and small fruit is still shedding.

The set of fruit so far has been heaviest on grapefruit and lightest on valencias with mid-season oranges ranging in between.

The mature crop of Valencias is being picked for market faster than

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Citrus fruits - Florida - West

Citrus Conditions And Grove Practices On Lower West Coast

BY CARL HEUCK,

Fort Myers, Florida, At Meeting Of Florida State Horticultural Society

In this discussion, citrus conditions and grove practices will be confined largely to Lee County, as the writer is more familiar with conditions in this section than in other areas of the lower West Coast. The citrus growers as a whole are feeling the effects of the low prices of fruit this year and in many instances production costs will have to be lowered in producing the crop for the 1938-39 season.

The oldest groves in the County are about sixty years of age, and are planted on heavy hammock land bordoring the Caloosahatchee River north and east of Fort Myers. The Orange River, a tributary of the Caloosahatchee, is also bounded by groves of high production growing on the better grades of hammock land. Many of these hammocks have outcroppings of marl rock and this soil type adds extra quality to fruit grown on such land. Other soil types in this area consist of the better grades of flat-woods land, but are not as desirable as the true hammock type.

Artesian wells are common on the lower West Coast and are found throughout the citrus area. Growers find that irrigating is a comparatively simple problem on the lower West Coast where such wells are used. A valve is opened and the water allowed to flow in open ditches through the grove. In some instances water is conducted in canvas hose from the flowing well to various sections of the grove and growers have found this method of conveying water very satisfactory.

The cold hazards in the vicinity of Fort Myers are not as severe as in other sections of the State. In December of 1934 the official low temperature at Fort Myers was 29 degrees. Groves were damaged to some extent, but most of them recovered quickly within the next twelve months period. During the season of 1935-36 the official low recorded at Fort Myers was 34 degrees. Last winter on November 22nd the weather station reported a temperature of 36.9 degrees, and on December 7th a temperature of 36 degrees was recorded. With the comparatively warm winters that are evident on the lower West Coast, growers are able to force an early bloom and flush of growth ahead of other citrus producing areas. This is one objective that is extremely important in the production of early fall fruit. Growers have found that the early fall market is usually high and aim to produce fruit for movement through September and early October. This is true particularly of grapefruit. Grapefruit trees receive a heavy application of inorganic nitrogen about January 1st and within a short period, under favorable weather conditions, the buds begin to swell and a new flush of growth and bloom follows.

In the vicinity of Fort Myers frost damage is seldom severe enough to cause damage to this growth. By September 1st the bulk of the early bloom grapefruit is sufficiently mature for shipment and prices over the last few years have averaged from $1.00 to $1.50 per box on the tree. Lee County has a reputation of being one of the earliest grapefruit producing counties in the state and growers continue to strive hard for early grapefruit production each season.

There is probably more acreage of seeded grapefruit on the lower West Coast than there is of seedless. As a general rule after the early crop has gone to the market the canners then purchase much of the balance. With the low prices of grapefruit the past few years, most of the seeded varieties have been taken by the canneries. They seem to prefer grapefruit from the lower West Coast and have paid a premium in many instances for grapefruit grown in this area.

As for oranges, the mid-season oranges begin movement by the 10th of October. Growers also strive hard to get an early bloom and growth on their orange trees for early fruit, and generally have such growth hardened before aphid injury is severe. For the past few years, however, aphid injury has been severe in oranges on later growth. One packing house in the County last season had moved the bulk of their mid-season oranges by the middle of November. The production of early fruit is the outstanding objective of growers in this section of the State.

Storm and wind hazards are probably greater on the lower West Coast than in many other sections. The storms over the past ten years that have hit Florida have done considerable damage on the lower West Coast. Growers are planning more wind breaks around the groves to combat this hazard.

The lowering of production costs is receiving careful attention, particularly this year with a large crop of fruit in prospect over the State. Growers are paying more attention to the conservation of their cover crops and are growing these in abundance. Dolomitic limestone has been used with success in many of the groves in this area and the growth of natural cover crops has increased tremendously. Very little crotalaria, beggarweed or other legumes are found in the groves due to the uncertainty of the stands and growers are relying largely upon natural grass, Spanish needles and such other vegetation. It is possible to grow heavy stands of natural grasses in this area and every bit of this material is incorporated into the soil in the fall of the year. By incorporating heavy tonnages of green material and humus into the soil, growers are able to use the cheaper inorganic fertilizers throughout the spring.

Many growers are still using from two to three applications of a balanced fertilizer per year, but many of the growers are now devising ways and means of cutting their fertilizer costs. Considerable interest has also been manifested in the past year in using so-called minor elements, particularly manganese and magnesium. Demonstrations under way have proven the merit of these materials.

On early grapefruit where scab and melanose are expected to be severe, a dormant spray of Bordeaux is applied. This is followed in some instances with a second application two to three weeks after the bloom is shed. The general practice, how-

ever, is to omit the Bordeaux applications, as considerable difficulty has been encountered in groves where the copper sprays have been applied.

Growers as a whole on the lower West Coast are following the Spray and Dust Schedule under the "Better Fruit Program" published by the Florida Citrus Commission. Practically all growers are using the lime sulphur program, plus wettable sulphur, for rust mite control, applying the first application about the middle of April. Florida red scale is generally prevalent each year and is one of the most important insect pests on citrus trees. In controlling this pest, growers generally apply liquid lime sulphur, plus wettable sulphur in May and June when the red scale is in the crawler stage.

Excellent results have been secured in some years with an application of this kind, as it kills great numbers of the young scale. In severe cases of Florida red scale infestation it is necessary to apply an oil spray in the fall of the year as a clean-up. This spray is applied after the early fruit has been marketed. Purple scale is present to some extent, but can be more easily controlled than the Florida red. Summer spraying with oil is avoided as far as possible as experience shows that if this application is not properly applied and the higher grades of oil used, a considerable burning of foliage and fruit results. Demonstrations are under way this year using zinc sulphate for the control of frenching and many of the larger growers are using this material in larger quantities for the first time this year in their spray program.

Adjoining the coast of Lee County are many islands, the largest of which is Pine Island, and due to the freedom from frost and cold damage on these islands, considerable interest has been manifested among growers in that area in the last few years in lime production. It is reported that one grower is now planning to complete a planting of one hundred acres of the Tahiti lime. These islands are ideally located for lime production, as the cold winds coming from the north and northwest are tempered by the vast expanse of the Gulf and Charlotte Harbor. New plantings of limes are being made on Pine Island, one the largest islands off the coast, being approximately twenty miles in length. Some excellent fruit of high quality is being produced in these lime groves at the present time, but most of the groves are still quite young.

In this section growers are experiencing trouble with the various bark diseases and gumming. While growers have not been able to successfully combat these diseases on limes, they do believe that it can be controlled to some extent by frequent fertilizing in small amounts and by cutting the cultivation to a minimum. It appears that the bark disease and gumming is more severe on trees that have received high amounts of nitrogenous fertilizers wheich in turn produce rapid growth. Growers are now applying their fertilizer in smaller amounts and putting it on more frequently. It appears that the trees should be kept slightly hungry in order to keep the bark disease under control. Cover crops are allowed to grow in abundance and a mowing machine used in preference to harrows. Growers are continuing this practice with the hope of being able to partially control the disease on limes in this manner. However, there are still many things yet to be learned in the control of this trouble.

There is also some acreage of Key limes on the islands that is progressing nicely. This variety has been quite subject to wither tip and anthranose, and growers have found that Bordeaux spraying is necessary for the partial control of this trouble. The Key lime offers possibilities on the islands and is well suited for growing in this section. Some of the finest quality oranges and grapefruit are also produced on Pine Island and buyers generally pay a premium for fruit grown in this area.

The islands are more subject to damage from high winds and storms than on the coastal regions and trees on the islands have been severely whipped in the past years. Growers in this area are taking more interest in wind breaks each year.

Summing up, growers in this section feel that with a favored geographical location that they are in a position to "carry on" under the present outlook conditions and will continue to produce early fruit for the market and in turn strive to lower production costs in future years.

GROVE CONDITIONS AND CULTURAL PRACTICES IN THE NORTHERN AREA

(Continued from page 11)

usual. One factor causing this is that the fruit is losing quality rapidly. Very few crops are holding to a good grade on the tree. Sizes of many crops have become too large with an accompanying coarsening of the rind and drying out.

Aside from the need of rain groves, generally speaking, are now in good, average condition. The Spring flush matured well and shows very little typical Frenching. Of course, this is the season of the year when trees should look their best as many poor soil conditions are not reflected in the tree until the crop is maturing.

Cultural Practices

Cultural practices in the Northern Area include everything that is done any place in the State.

The fertilizer program varies from the use of mixed goods which run high in water insoluble nitrogen to an opposite program which has no time for natural organic fertilizer materials and which depends almost entirely upon nitrate nitrogen.

The system of cultivation also includes all systems. Some groves are plowed regularly every year, while others are never plowed. Some depend entirely upon a disk harrow and others use nothing but a cover crop chopper.

The pest control program also varies somewhat but it has become more standardized since the advent of the Better Fruit Compaign. Recently, more control work has been done by spraying and less by dusting. By far the greatest amount of spraying has been the general combination of lime sulphur solution plus wettable sulphur. A great deal of spraying to improve tree condition has been done and with outstanding success, specially following the copper, zinc, sulphur combination.

The grade of fruit in this section has materially improved due to more thorough control measures. This year, however, due to failure to control rust mite during the winter a considerable volume of fruit which

Growers & Shippers League of Fla.

had been kept bright was allowed to get rusty and the grade, thereby, was lowered.

In the matter of cultivation, there are very apparent trends in the Northern Area. The disk harrow, which has been improved so much in recent years, is being used more and more and the acme harrow less. The cover crop chopper is being used more and the mowing machine less. Chopping the cover crop is less expensive than mowing and the light cultivation a chopper gives is considered an advantage, except in cases where it would be inadvisable to stimulate the tree.

While the great improvement in the equipment itself is influencing this trend in cultivation practices a more important factor is that the coperative caretaking of groves has grown so rapidly in this part of the State. Where a great number of groves which are miles apart have to be cultivated it is esaier and cheaper to use the disk harrow and cover crop chopper than a plow, acme harrow and mowing machine.

On the whole less cultivation is being done than in the past. Early varieties are being laid by earlier and valencias are being worked less in the Fall and Winter.

There is no fertilization program which could be discussed as being common to the Northern Area nor is there any specific program followed entirely even in more local sections. The only safe statement to make is that some fertilizer is applied every month in the year with the heaviest applications going on in November-December, late April-May, and early June and usually some top dresser in the Spring. This year, however, because of the favorable tree condition very little top dresser was used.

The one analysis most largely used carries 4 per cent nitrogen, 8 per cent potash, and from 6 per cent to 8 per cent phosphoric acid. Next in volume used would no doubt be a 3-6-8 or 3-8-8 with a 4-6-5 or 4-8-5 following and then, in point of tonnage used, would come a great variety of analyses carrying from 2 per cent nitrogen to 10 per cent or 12 per cent potash.

Most of the fertilizer used is in the form of mixed goods and these are generally formulated along the same line as has been customary for many years. That remark applies to most of the fertilizer used, but by no means does it describe all of the fertilizers applied to groves in this area. There is considerable tonnage which carries out of the ordinary ratios between nitrogen, phosphoric acid, and potash and which is derived largely from chemical materials. Also there is enough acreage fertilized with straight materials so that this system must be considered.

The picture I would like to convey to you is that most of the acreage still gets fed with what may be called "Regular-standard-fertilizers" but that a very significant acreage gets most of its plant food in the form of materials or miscellaneous mixtures.

The information which has been developed by research workers in this State is being put to practical use through the incorporation in fertilizer mixtures of materials shown to have value but which, until recently, were seldom used. Many direct applications of materials such as magnesium sulphate have been made and the generally improved condition of groves can be traced to the widespread use of information developed through research done by State and Federal men.

The subject of fertilization could not be left without reminding you that this section, which for years has been a hot-spot for competition among the old established fertilizer manufacturers, has had added to it a number of new cooperative and privately owned fertilizer factories.

Grove conditions are, on the whole, very satisfactory in this Northern Area and cultural practices followed are improving the quality of fruit each year.

Growers-Shippers To Hold Annual Meeting

Leaders in the Florida citrus-vegetable industry will converge upon Orlanda on June 8 for the 15th annual meeting of the Growers & Shippers League of Florida. The session will include many features of interest to growers and shippers, including the annual address of R. B. Woolfolk, League president, Thos. D. Guthrie, Traffic Manager for the League has announced. The main event will be the banquet in the Angebilt Hotel at Orlando, commencing at 7:00 o'clock on the evening of June 8.

Success of the Growers & Shippers League in dealing with traffic-transportation problems for Florida growers and shippers has been phenomenal and millions of dollars, it is estimated, have been saved the industry through the activities of the organization in securing lowered freight rates, reduced refrigeration charges, expedited movement by rail, boat and truck, etc., over the fifteen year period in which the League has functioned. The League is a voluntary, non-stock, non-profit corporation of citrus fruit and vegetable growers and shippers of Florida. It handles all important questions which affect the citrus fruit and vegetable industries as a whole; such as the shipper's right to control routing; freight and refrigeration rates and charges; transportation services; general rules and regulations governing loss, damage and overcharge claims; custom tariffs and other governmental relations; State and Federal legislation which applies directly to the citrus fruit and vegetable industries of Florida; and various other questions of a general nature which affects the upbuilding of the fruit and vegetable industries without reference to the various methods of marketing.

R. B. Woolfolk, the president of this well known organization, has given liberally of his time and money in building up the League's prestige in recent years. His annual address will be awaited with much interest by members, as will be talks from other League executives.

The League maintains a complete file of freight tariffs and statistics on production, shipment and dsitribution of citrus fruits and vegetables. The manager compiles from time to time various analyses of the competitive rates charges from California, Texas and Florida to various destinations and keeps the members of the industry informed as to the relative charges from each producing section, together with shipment and distribution data. Numerous bulletins are issued throughout the season and distributed to members, keeping them abreast of the times, particularly in respect of changes and proposed changes in rates, charges, containers, load minima and all such information as is needed by shippers who are busy shipping fruits and vegetables, or growers who make it their business to keep well informed at all times.

The League is continuously active in these matters and has earned the support of every grower and shipping organization in the state —and a majority of the important ones have been members for many years. Recent gains in membership are noted by Mr. Guthrie, the traffic manager.

The Growers' Own Page

This department is devoted to the growers, for their use in giving expression to their views and a discussion of growers' problems. Any grower is welcome to make use of this department for the discussion of topics of interest. The only requirements are that the articles must be on some subject of general interest, must be reasonably short and must be free from personalities. The editor assumes no responsibility for views expressed, nor does publication imply endorsement of the conclusions presented.

THE CITRUS SITUATION

Miami, Fla., May 9, 1938

Mr. S. L. Frisbie,
Editor The Citrus Industry,
Bartow, Fla.,
Dear Sir:

I have watched the marketing condition on citrus fruits in Florida for the past twenty years and of all they have had during that time and up to this day, I say they never had a market that was any good to the grower.

I have been a salesman for the past thirty-five years all over the United States and Canada. With all the exchanges and associations there are in Florida, how does the man who produces the fruit come out?

There is no need for me to go into the reasons why growers do not get more for Florida oranges and grapefruit. There are plenty of reasons why they don't get more for Florida fruits.

I wonder if Florida growers would just let Texas and California attend to their own citrus problems and we of Florida handled just Florida citrus conditions, if that would not help us some. There is too much California interest connected with our citrus conditions to be of any help to the Florida citrus grower.

I know that Florida has the oranges and grapefruit and the trade and the consumers of the United States want Florida citrus fruit at a price where the producers can make a living.

If there are any citrus growers in Florida who really want to get a decent price for their fruit, I would like very much to hear from them. I advocated the distilling of oranges into orange brandy over 6 months ago as one way for bettering prices, and that alone would do more for the orange growers than anything that has been offered to help the growers up to this time. When they dream about what distilling oranges into orange brandy will do for the producers of Florida, then I will go deeper into that subject with them.

As I see it, the only things which will help the citrus growers are organization and co-operation. The same thing applies to the growers of avocadoes and Persian limes. In February limes were bringing 35 cents clear.

Keep California interest out of this state and we can go ahead.

Yours truly,
Capt. Jos. Greenbalgh,
Box 1688,
Miami, Fla.

SHARP DROP IN TANGERINE PRICES CAME WITH GREATLY INCREASED PRODUCTION

Florida supplies practically all of the tangerines shipped to commercial markets of the U. S., the State Agricultural Extension Service reports. During recent years, the industry in Florida has been faced with greatly increased production accompanied by a sharp downward trend in returns to growers.

In the 1920-21 through 1922-23 period production averaged 683,000 boxes, and on-tree price averaged $3.54 per box. With a slight increase in production to 767,000 boxes in the 1923-25 through 1925-26 period, prices fell off to $3.08 per box. In the 1926-27 through 1928-29 period, production increased further to 1,067,000 boxes, and the on-tree price dropped to $2.15. A rise in production to 1,633,000 boxes in the 1929-30 through 1931-32 period saw a sharp drop in on-tree prices to 72 cents per box.

Florida tangerine production continued to climb in the 1932-33 through 1934-35 period, going to 1,950,000 boxes. The on-tree price for that period averaged 54 cents per box. Production of Florida tangerines showed a more marked rise for the 1935-36 through 1937-38 period, the crop averaging 2,450,000 boxes. The on-tree price for this period is estimated to average only 56 cents per box, showing practically no recovery from the depression period levels.

SKINNER FILES SUIT

B. C. Skinner of Dunedin has filed suit against Jesse H. Finkler, surviving member of the firm of Finkler & Finkler, to recover what he considers exorbitant attorney's fees deductions from collections made by the firm on a suit entered by Mr. Skinner against the Nu-Pak Corporation. The suit was filed in New York City by the firm of Ryan & Cassin and is expected to be reached for hearing in June or October.

One hundred and twenty years ago, it required the labor of 83 out of every 100 workers in this country to produce the necesary amount of crops from the earth; today, with the available agricultural machinery, it requires the labor of only 17 out of every 100.

CHEMICAL COMPOSITION OF FLORIDA CITRUS SOILS

(Continued from page 9)

direct measure of the potential fertility of a soil.

The total sum of the exchangeable bases, excluding hydrogen, expressed as per cent of the exchange capacity is defined as "per cent base saturation". A soil is 100 per cent base-saturated when the sum of the exchangeable calcium, magnesium, potassium, sodium and manganese is equal to the exchange capacity. Such a soil should have a pH value of 7.0 or about 8.0 if free carbonates are present as shown by samples Nos. 145, 146 and 157.

At 50 per cent base saturation half of the exchange capacity of a soil is utilized by bases like calcium, magnesium and potassium, and the other half is saturated with hydrogen which causes soil acidity. With a few exceptions all the surface and the subsoil samples examined in the Norfolk series having pH values below 5.5 showed less than 50 per cent base-saturation, while the samples with pH values above 5.5 showed over 50 per cent base-saturation. A fair relationship can be seen in the table between the per cent base-saturation of the various soils and their pH values. Any departure from this relationship is undoubtedly due to the presence of free fertilizer salts which would be determined and calculated as the sum total of the exchangeable bases, hence making the values for per cent base-saturation somewhat higher than the pH vaules would indicate. It should be obvious, therefore, that the total amount of exchangeable bases (excluding hydrogen) that can be maintained in a soil is dependent on the exchange capacity and the degree of base-saturation. Although it seems very desirable to maintain a high degree of base-saturation by replacing hydrogen with bases like calcium and magnesium through applications of liming materials, any attempt to raise the degree of base-saturation to exceed a certain pH value might render manganese and zinc unavailable, thus inducing manganese deficiency and frenching. From the foregoing discussion it should be clear that some caution must be exercised in estimating the lime requirement of soils from pH values alone without due consideration to any possible variation in the excange capacity of the different soils.

The exchange capacity of the surface layers in sandy soils is considerably higher than that of the corresponding subsoils because of the higher organic matter content of the surface layers. This is also reflected in the greater amounts of the exchangeable bases present in the surface layers. The per cent base-saturation and consequently the pH values, are also higher in the surface samples than in the corresponding subsoils. In taking the soil samples it was interesting to observe that most of the fine fibrous citrus roots were present in the dark or gray surface layer. The depth of distribution of the fibrous roots was largely determined by the thickness of the surface soil horizon. Only a few fibrous roots were usually noticed in the yellow or gray subsoil immediately below the surface layer. The distribution of fibrous roots and the great differences in chemical composition found between the surface and the corresponding subsoil samples would indicate that the important feeding zone in most of the light sandy soils is limited to the surface layer.

Since calcium is the predominating base in the colloidal complex, the amount of exchangeable calcium found in the various soils is quite proportional to the exchange capacity at approximately the same pH values. For the same reason the exchangeable calcium was found to increase with the increasing pH values in soils having the same exchange capacity. The effect of the pH value or the degree of base saturation on the actual amounts of calcium and other exchangeable bases that may be found in a Norfolk soil with an average exchange capacity is clearly illustrated if we compare samples Nos. 134 and 135 with samples Nos. 182 and 183.

Although the amounts of exchangeable potassium varied unduly even in soils having the same exchange capacity there was a general increase in the amounts of exchangeable potassium with the increasing exchange capacity of the soils. If we compare the small amounts of potassium found in certain soils with an average annual application of potash the loss of potassium through leach- commonly used, it would seem that ing in acid soils very low in exchange capacity is much greater than is usually assumed.

In contrast to calcium and potassium, the exchangeable magnesium found in the light sandy soils is not necessarily proportional to the exchange capacity since this element has come into general use rather recently. Many light sandy soils low in exchange capacity that had been maintained very acid for a long period of time and which had never received magnesium from any of the common sources prior to the date of sampling were found to be extremely deficient in magnesium, containing as little as 5 pounds of magnesium per acre. On the other hand, the better grades of sandy soils, especially those that had received considerable bonemeal in the past, showed somewhat higher quantities of magnesium. It should be noted here, that by the time this survey was undertaken, magnesium had come into such general use that a majority of the groves sampled had received at least one application of dolomite or soluble forms of magnesium and upon analysis showed considerable amounts of exchangeable magnesium. In general, severely bronzed groves that had received dolomite or soluble forms of magnesium in the fall of 1936 or spring of 1937 when the soil samples were taken showed much less bronzing this spring (1938). Samples Nos. 118 and 119 were taken from the plots at the Citrus Experiment Station showing a very marked response to the application of "Emjeo" and dolomite. All of the Norfolk soils with the exception of samples Nos. 198, 199, 160, 161, 206, 207, 118, 119, 251, 252, 200, 201, 284 and 285 had received at least one application of dolomite prior to the collection of soil samples. The calcareous low hammock soils were found to contain much larger quantities of exchangeable magnesium as shown by the three Parkwood soils. On the other hand, the acid soils such as Portsmouth commonly associated with the Parkwood soils, showed much less and varying amounts of exchangeable magnesium depending on the ex-

change capacity and the fertilizer practice.

Most of the soils examined were found to contain only small amounts of manganese showing less than 3 pounds of exchangeable manganese per acre for the surface layers regardless of the exchange capacity. From our limited data it is impossible to say whether such small amounts of manganese in the order of 1 to 5 pounds per acre are adequate to meet the requirements of citrus but it should be pointed out that distinct manganese deficiency symptoms were observed in many groves showing this amount of exchangeable manganese in the surface layer. It is interesting to note that the surface soil sample No. 251 was taken from a grove that had received an application of manganese sulfate and represents one of the few groves showing a higher content of exchangeable manganese in the surface layer. Samples 145, 146 and 157 are typical of the so-called "marl spots" usually found in the cabbage-palmetto hammock soils where the marl layer comes close to the surface or has been mixed with the surface layer in mounding the trees. Common types of frenching due to zinc deficiency and prounced symptoms of manganese deficiency or sometimes locally referred to as "marl frenching," are usually associated with the "marl spots." That manganese is subject to rapid oxidation and precipitation into unavailable forms in these soils is borne out by the fact that the grove from which sample No. 157 was taken had received an application of manganese sulfate at the rate of 500 pounds per acre for three consecutive years prior to sampling. The oxidation of manganese and its subsequent precipitation into highly insoluble forms proceeds rapidly in soils with pH values above 7.0 and is extremely rapid in marl soils which usually have pH values about 8.0. It is obvious, therefore, that nothing can be gained from very heavy applications of manganese salts on marl soils at any one time in the correction of manganese deficiency, but smaller and more frequent applications should prove more economical and equally effective.

The total nitrogen content of the various soils as shown in the table is governed to some extent by the amount of organic matter, the light sandy soils showing much smaller amounts of total nitrogen than the hammock soils. That nitrate nitrogen content in soils is subject to considerable fluctuation depending on moisture conditions, leaching and fertilization is well known. There is a good indication that soils high in total nitrogen content are more likely to maintain a higher and a more uniform concentration of nitrate nitrogen as shown by the surface sample of Parkwood loam (sample No 145) containing 420 pounds of ni trate nitrogen per acre—six inches of soil. This is the highest amount of nitrate nitrogen found in the samples examined.

General Discussion

From the table it is evident that citrus is grown in Florida on a great variety of soils. There is considerable variation within any one group or series. As shown for the Norfolk series, the fertility of these soils as well as other light sandy soils can be evaluated on the basis of the exchange capacity which in turn is determined largely by the amount of organic matter present in the soil. It should be recognized that proper management and fertilization of the various types of soils must be intimately associated with the exchange capacity since the amount of the various exchangeable bases that can be maintained in any soil even through the best fertilizer practise and management is limited by the exchange capacity. This is well illustrated by soil samples Nos. 292, 293, 296 and 297 which represent our poorest grade of Norfolk soils and are typical of what is sometimes called "black-jack" land. One of the surface samples, No. 292, already showing 64 per cent base saturation and a pH value of 6.25 contains smaller amounts of the exchangeable bases than some of the better grades of Norfolk soils with much lower pH values.

In many instances abrupt variations in the exchange capacity were found within the same soil series in the same grove. This variation in the soil was often markedly reflected in the tree condition especially where no adjustment had been made in the fertilizer practice. It is a common mistake to overlook any variations in the soil and treat the grove alike despite any apparent changes in the soil or the condition of the trees. The effect of the variation of the exchange capacity upon the content of exchangeable bases is clearly depicted in samples Nos. 198, 199, 200 and 201, taken from two adjacent blocks in the same grove under the same management. The general appearance of the trees in the block from which samples Nos. 198 and 199 were taken was very poor, whereas the trees in the adjacent block (samples Nos. 200 and 201) were in excellent condition and apparently free from any of the common deficiency symptoms. It would be futile and almost prohibitive to attempt to maintain the same amounts of exchangeable bases in both of these soils because simple calculations show that the sum total of exchangeable bases in the better block exceeds the exchange capacity of the poor block by 1.9 milliequivalents per 100 grams of soil. To insure an adequate supply of potash, for instance, or any of the other bases in a soil with such a low exchange capacity and to minimize losses by leaching, it would seem practical and economical to make more frequent applications of fertilizers. The hammock soils on the East and West Coasts are even more variable than the well drained upland soils. It is not unusual to find several distinct soil types in the same grove. There is also considerable variation among the hammock soils belonging to the same group or series. One of the most serious problems confronting the growers on low hammock land is due to the variable nature of the Parkwood soils in regard to the depth of the marl layer. Two of the Parkwood soils given in the table were taken from two adjacent blocks in the same grove.

(Continued on page 21)

citrus fruits - D

Summer Drop of Citrus Fruit

BY W. W. YOTHERS
Consulting Citriculturist, Orlando, Florida

From late June until early September and sometimes even later, there is an enormous quantity of citrus fruits which falls from the tree. No actual estimate has ever been made as to the tonnage which thus falls, but last year no doubt it was more than a million boxes. Perhaps it was nearer two million than only one. Last season pineapples and Hamlins were especially subject to drop, and in a few cases almost the entire crop fell before the fruit reached legal maturity. Such fruit as remains is coarse and rough, has low solids, matures late, does not carry well, will not color well in coloring rooms and on the whole, is very inferior. In some cases, this fruit is blemished characteristically and in some cases it splits before it falls with ammoniation spots. If apparently sound fruit on these trees are cut open, gum will be found around the central axis. This is almost universal.

Last April, I found that it could be told at that time if the fruit in any particular grove would have an unusual percentage to fall off. In fact it can be told in April or early May with absolute accuracy. In groves which have had a large percentage of fruit to drop last year and this year, there will be considerable percentage of young fruit present now with gum around the central axis. Perhaps a hundred fruits should be cut open to determine the severity of the trouble. I have already found groves with fruit almost filled with gum.

Without discussing the cause or causes of such condition, the following procedure will produce practically 100 per cent results.

1. Apply at once 1½ to 2½ lbs. Bluestone per tree, depending on the size of the tree. This should be scattered wide and an attempt made to put some of it all over the entire surface.

2. The grove should be sprayed before the middle of June, the sooner the better, with the following formula:

Copper Sulphate 2 lbs
Zinc Sulphate, 2 lbs.
Lime, 2 lbs.
Wettable Sulphur, 10 to 12 lbs.
Water, 100 gallons.

Procedure: After 25 gallons of water are in the tank, add lime, agitator running, when the tank is practically full, sift in the bluestone and zinc sulphate, agitator running. Wait one minute, then add Wettable Sulphur.

3. Sometime late in June or better in July, if any fruit whatever drops, add 1½ lbs. more of bluestone, scattered wide.

4. Stop all cultivation at once, and preferably apply no fertilizer until this fall, or at any rate, omit all nitrogen.

5. In most instances, wood ashes will help to remedy this trouble. It may be that No. 2 can be omitted except in cases of great severity.

In case scale insects develop on late and mid-season oranges, these can be sprayed with oil emulsion and Hamlins and Parson Browns should not receive this insecticide. If scales develop on these early varieties, they should be controlled by a heavy application of sulphur.

While the above procedure will prevent the dropping of fruit it, of course, will not take out gum that is already in the young fruit. Oranges free from gum will not be produced until another season, but the above procedure will prevent fruit from falling.

FARM LOAN ASSOCIATION MOVES OFFICE TO LAKELAND

Formerly known as the Plant City Prodcution Credit Association, located in Plant City, this company under the mangement of Secretary J. E. Crumpton, last month moved its offices to Lakeland where it now operates under the name of the Lakeland Production Credit Association.

Operating as a part of the national farm loan association this company has been highly successful during the years of its existence and both general farmers and citrus growers in the eight counties it serves will now be served from the Lakeland offices in the future.

Associated with Mr. Crumpton in the active operation of the Association is Ledley Wear, well known Bartow man.

Plans are now being made by County Agent R. E. Norris for resumption of the Lake County citrus schools inaugurated and carried on by his predecessor, Clifford Hiatt.

THE CHEMIST LOOKS AT THE CITRUS PRODUCTS INDUSTRY IN FLORIDA

(Continued from page 7)

ed attention to the possibilities of pectin in the preparation of lacquers, but with the price of pectin at $1.00 per pound and with sulfite pulp and cotton linters (the present basic substance for lacquers) considerably cheaper, there seems to be little hope here. Work has been recently carried out in this country on the use of pectin as a bactericide, and as an aid in promoting the healing of wounds (7). Many clinical tests will be required before any reputable physician would prescribe pectin for this purpose. Should such tests prove successful, the outlet for pectin in this field would be limited. The value of pectin in the treatment of infantile diarrhea is now recognized by all physicians (8). Another use of pectin is the production of suspensions of barium sulfate for use in x-ray where it is essential that the barium sulfate meal ingested by the patient remain in uniform suspension as it passes through the alimentary canal rendering it opaque to x-rays and disclosing any abnormalities on the photograph taken by the physician. Thus we see progress has been made in discovering new uses for pectin, but outlets which will consume large volumes of the material must be found. Then, too, work should be directed towards establishing the constitutents of citrus pectins because very likely there is a difference in combination of these constituents in pectin from oranges and grapefruit. This is rather fundamental, but important to obtain a true picture of this substance.

Orange and grapefruit oils find their use limited to the flavoring field and to an even more limited extent, in the cosmetic industry. Here, too, new uses should be found for these oils to increase the demand. The quantity of flavoring constitutents in these oils is extremely small, amounting to less than five per cent. The other 95 per cent consists of bodies the chemist classes as terpenes which contribute little or nothing to the aroma of the oils. Theoretically, camphor could be made from orange or grapefruit oil. But it would not pay because one would have to compete with turpentine and other raw materials much cheaper than citrus oils. Thus here, too, it is the problem of the chemist to find new and wider uses for orange and grapefruit oils.

Time will not permit a full discussion of the problems confronting the establishment of an important citrus products industry in Florida. Briefly, might be mentioned the need for a search for new uses for naringin, the bitter principle of grapefruit, and for hesperidin, a substance of the same chemical family and found in oranges. Both these substances may be easily and cheaply separated from refuse fruit. New uses for cannery refuse other than drying for cattle feed should be found. The freezing of citrus juices, especially tangerine juice, should be investigated. Some will shudder at the mention of freezing citrus juices recalling the experience in freezing orange juice in Florida about eight years ago. The technical aspects of preserving foods by freezing have made tremendous strides during these eight years and frozen foods have become an important article in the diet in this country, in some instances replacing the fresh commodity. A comprehensive study should also be made of the factors responsible for the decrease in vitamin C content of citrus juices during processing and subsequent storage.

In closing, I should like to quote Professor H. Clark Powell of the University of Transvaal, South Africa, who made a study of the citrus industry in California (9). Powell says "the citrus industry in California is universally acknowledged to be the most soundly organized agricultural enterprise in the world." By proper application of scientific and technical progress there is no reason at all why the citrus industry in Florida could not also be rated as one of the most soundly organized agricultural enterprises in the world.

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Table I

Partial Analysis of Liquid Waste from Citrus Drying Plants

	Plant 1	Plant 2
Total Solids %	6.26	4.88
Ash %	0.50	0.48
pH	8.8	7.7
Pectin %	0.58	0.54
Total Sugars %	2.78	2.44

MAN WHO INTRODUCED GRAPEFRUIT IN ENGLAND LEAVES BIG ESTATE

Mr. William B. Shearn (known to the trade as "Joe" Shearn) a noted florist and fruiterer, who died in January, left about £100,000. Before his death at his Regent's Park home he drew up a will, in which he remembered in generous fashion all the members of his staff who had helped him to amass so large a fortune. He died before he had time to sign the will, but his widow is carrying out its provisions to the letter, and every member of the staff with five years' service or more to their credit will benefit. The business was established in a small way by his father 80 years ago. The trade in "Flowers by Wire" was started after "Joe" had paid a visit to America, where the system had been in vogue a considerable time.

He is said to have introduced the Grapefruit to England, and to have opened the first fruit restaurant, which is still a flourishing concern in spite of the fact that many fruitterian and vegetarian restaurants started since then have come an an untimely end.

—The Gardner's Chronicle, Apr. 16, 1938.

The wise employer is more concerned with the results accomplished by an employee than with the methods employed — so long as the methods are honest.

Soils, Composition

Chemical Composition of the Important Types of Florida Citrus Soils

Soil Type	Sample No.	Depth (in.)	pH	Exch. Cap (1)	% Base Saturation	lbs. per Acre - six inches (2) Exchangeable Ca	Mg	K	Mn	Nitrate N	% Total N	% Organic Matter (3)	Ratio Ex. Cap. Org. Matter
Norfolk	292	0-5	6.25	1.41	64.0	290	37	21	0	2.0	.022	0.93	1.52
sand	293	5-18	4.96	0.80	13.5	28	5	13	0	0	.008	0.63	1.27
Norfolk	296	0-5	5.86	1.45	44.8	193	30	33	1.2	3.0	.025	0.92	1.58
sand	297	5-18	4.96	0.81	16.7	40	3	17	0.3	0	.011	0.59	1.37
Norfolk	300	0-6	4.96	1.54	32.5	150	19	40	1.5	2.5	.028	0.99	1.56
sand	301	6-18	4.38	0.94	12.2	28	3	25	0	0	.012	0.65	1.45
Norfolk fine	198	0-6	6.25	1.54	86.0	484	10	62	0.5	10	.020	0.89	1.73
sand	199	6-18	5.24	1.02	16.5	48	2	33	0.3	4.5	.008	0.56	1.82
Norfolk fine	138	0-6	5.71	1.75	60.0	315	49	53	2.1	3.0	.031	1.31	1.34
sand	139	6-18	5.01	0.70	19.0	32	8	17	0.6	0	.009	0.57	1.23
Norfolk fine	160	0-6	5.44	1.85	31.0	194	5	55	1.0	5.4	.023	1.01	1.83
sand	161	6-18	5.01	1.11	10.6	30	5	19	0.3	0	.009	0.56	1.98
Norfolk fine	206	0-5	5.55	1.87	45.8	316	5	37	0.9	15	.036	1.05	1.78
sand	207	5-18	5.19	0.92	22.7	70	3	16	0.2	18	.010	0.45	2.04
Norfolk fine	118	0-6	4.79	2.02	33.5	230	9	49	2.2	2.9	.024	1.17	1.73
sand	119	6-18	4.75	0.71	10.5	20	4	8	0.5	0	.008	0.46	1.55
Norfolk fine	196	0-6	5.66	2.44	68.5	580	38	53	1.8	11	.043	1.47	1.66
sand	197	6-18	5.05	1.03	21.3	73	2	25	0.2	1.5	.010	0.50	2.06
Norfolk fine	134	0-6	5.94	2.45	68.5	492	71	100	2.3	4.3	.038	2.21	1.11
sand	135	6-18	4.95	1.24	13.1	38	10	20	0.7	0	.011	0.60	2.07
Norfolk fine	182	0-5	4.60	2.49	20.6	174	11	21	2.8	0	.033	1.37	1.82
sand	183	5-18	4.64	1.29	12.6	48	5	17	1.8	0	.011	0.64	2.02
Norfolk fine	136	0-6	5.50	2.51	52.5	420	32	110	4.7	5.0	.039	1.61	1.56
sand	137	6-18	5.30	1.03	17.2	56	1	23	0.9	1.0	.012	0.61	1.69
Norfolk fine	170	0-5	5.84	2.99	70.0	705	67	46	1.8	77	.048	1.50	2.00
sand	171	5-18	4.44	1.64	12.0	63	6	11	0.4	18	.013	0.66	2.48
Norfolk fine	251	0-6	5.45	3.70	80.2	1065	27	130	17.3	24	.062	2.03	1.82
sand	252	6-18	5.10	1.24	45.8	194	6	43	0.9	7.0	.010	0.62	2.00
Norfolk fine	247	0-6	5.51	3.80	80.8	1000	54	270	2.6	31	.073	2.47	1.54
sand	248	6-18	4.76	1.65	26.1	134	5	60	0	4	.011	0.61	2.70
Norfolk fine	200	0-7	6.35	4.97	68.5	1240	24	150	1.2	5.5	.262	2.24	2.21
sand	201	7-18	5.31	2.64	16.0	133	8	42	1.4	9.0	.016	1.40	1.88
Norfolk very	284	0-8	5.41	6.25	32.5	655	38	162	9.3	6	.052	.262	2.39
fine sand	285	8-18	5.05	3.04	12.7	122	6	43	1.6	0	.016	1.45	2.10
Blanton fine	166	0-6	5.84	3.89	66.0	875	70	66	2.5	33	.049	1.87	2.08
sand	167	6-18	4.71	1.82	17.2	96	8	31	0.7	10	.010	0.65	2.80
Blanton fine	253	0-6	5.54	4.18	75.0	1070	78	112	3.1	39	.057	1.85	2.26
sand	254	6-18	4.49	1.70	20.0	101	11	34	0.7	14	.013	0.69	2.46
Eustis fine	162	0-6	5.64	2.84	51.7	485	34	94	2.5	8.9	.034	1.46	1.95
sand	163	6-18	5.09	1.56	17.1	81	6	28	1.7	2.2	.012	0.72	2.17
Eustis fine	282	0-8	5.69	6.46	51.2	1120	59	208	2.8	4.0	.060	3.18	2.03
sand	283	8-18	5.00	3.60	19.5	321	7	93	1.9	0	.023	2.12	1.70
Lakewood	238	0-6	6.00	3.24	77.5	880	54	73	1.2	20	.057	1.67	1.94
fine sand	239	6-12	5.54	0.92	33.9	101	5	30	0	3.6	.016	0.47	1.95
	240	12-18	4.54	1.44	17.2	65	6	46	0	0	.013	0.70	2.06
Orlando fine	214	0-12	5.30	6.62	15.1	329	10	106	2.5	4.6	.057	4.06	1.63
sand	215	12-24	5.00	4.52	11.3	165	6	56	1.5	6.1	.039	3.12	1.45
Gainesville	226	0-6	6.00	8.50	41.2	1040	125	300	2.3	14	.086	5.50	1.55
fine sand	227	6-18	5.49	4.82	16.6	218	39	72	0.9	7.0	.033	3.68	1.31
Parkwood	142	0-8	5.46	6.95	64.5	1300	227	196	9.3	18	.016	2.79	2.49
sandy loam	143	8-18	6.50	5.72	79.5	1210	347	93	0.8	5.8	.038	2.20	2.58
	144	18-24	8.16	14.0	100	3950	950	200	0.6	2.1	.076	5.25	2.69
Parkwood	145	0-6	7.86	17.9	100	6450	347	313	0.8	420	.517	10.6	1.70
loam	146	6-18	8.19	6.63	100	2200	215	195	0.3	163	.219	4.95	1.34
Pkwd. clay loam	157	0-8	8.31	6.60	100	2070	284	210	0.4	97	.125	3.05	2.16
Portsmouth	150	0-11	5.64	3.73	66.5	775	102	80	1.7	7.0	.046	1.87	2.00
fine sand	151	11-24	5.30	0.87	55.5	148	21	22	0.7	1.7	.011	0.53	1.65
Portsmouth	154	0-12	5.26	5.48	55.0	910	133	140	5.1	6.1	.054	2.14	2.56
fine sand	155	12-18	5.06	0.86	54.5	152	16	19	0.5	2.0	.011	0.56	1.54
Bladen fine	268	0-10	5.45	5.31	69.5	1215	73	250	26.0	6.0	.065	1.68	3.16
sandy loam	269	10-24	5.86	21.6	86.5	5700	795	855	12.0	0	.040	2.25	0.60

1 - Exchange capacity expressed in milli-equivalents per 100 grams of soil. 2 - Calculations based upon the assumption that acre-six-inches of soil weigh 2 million pounds. 3 - Determined as loss on ignition.

CHEMICAL COMPOSITION OF FLORIDA CITRUS SOILS

(Continued from page 17)

One of these soils (samples Nos. 142, 143, and 144) was found in a part of the grove in which the trees appeared to be in excellent condition as compared with the trees in an adjoining block (soil samples Nos. 145 and 146) showing severe frenching and pronounced symptoms of manganese deficiency. Although the poor block has had more manganese sulfate applied to the soil in the past, the surface sample, No. 145, showed less exchangeable manganese upon analysis than the surface sample No. 142, of the good block. A number of examinations revealed that good groves were invariably found on soils having a profile similar to the one represented by samples Nos. 141, 142 and 143 already described, while the profile represented by samples Nos. 145 and 146 was found commonly associated with "marl frenching" and other symptoms of physiological disorders.

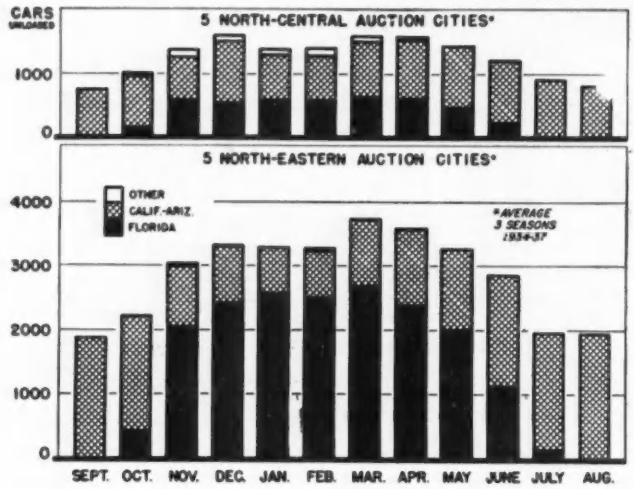
In conclusion, it should be pointed out that although considerable emphasis has been attached in this paper to the importance of the exchange capacity and the exchangeable bases, nitrogen, phosphorus, salt water damage and drainage are some of the other important factors to be considered in soil fertility. Unfortunately the analyses for zinc and copper have not been made because of the lack of proper analytical methods. Research work now in progress is devoted to the development of suitable methods for the estimation of small amounts of zinc and copper in soils and when satisfactory methods are available the samples collected in this survey will be examined for zinc and copper. A more comprehensive report on the chemical composition of our citrus soils will be published at a later date. Much of the information collected in this preliminary survey indicates the potential value of such work but the data are as yet inadequate for purposes of correlation.

(The table which is frequently referred to throughout this article appears on opposite page, page 20).

Stranger: "I hear you have a fine cow now. What will you take for her?"

Farmer (cautiously): "Wait a minute! Are you the new tax assessor or has my cow been killed on the railroad?"

FLORIDA ORANGES LEAD IN EASTERN AUCTIONS



More Florida oranges are sold in eastern markets during this state's shipping season than from all other producing areas, according to the State Agricultural Extension Service.

The accompanying chart shows average unloads of oranges from various producing areas for the seasons 1934-35 through 1936-37 at the five eastern auction cities of Boston, New York, Philadelphia, Pittsburgh, and Baltimore, and at the five central cities of Chicago, Detroit, Cleveland, Cincinnati and St. Louis.

Sanitary devices that will insure a safe water supply are a matter of vital importance to every rural home.

CLASSIFIED Advertisments

The rate for advertisements of this nature is only five cents per word for each insertion. You may count the number of words you have, multiply it by five, and you will have the cost of the advertisement for one insertion. Multiply this by the total number of insertions desired and you will have the total cost. This rate is so low that we cannot charge classified accounts, and would, therefore, appreciate a remittance with order. No advertisement accepted for less than 50 cents.

WANTED — Two thousand sweet seedling root stock, lining-out or better. H. M. Sherwood, Fort Myers, Florida.

FOR SALE—2000 Riverside No. 10 Grove Orchard Oil Heaters used only two seasons, excellent condition. 70c each, F.O.B. Marianna subject to prior sale. Marianna Fruit Company, Marianna, Fla.

ALYCE CLOVER SEED. Ripe and cleaned. Ideal cover and hay crop, Write for information. P. E. Synder, Box 866, Lakeland, Fla.

SEEDS—ROUGH LEMON, SOUR ORANGE, CLEOPATRA. Pure, fresh, good germination. Also seedlings lineout size. De Soto Nurseries, DeSoto City, Fla.

SCENIC HIGHWAY NURSERIES has a large stock of early and late grapefruit and oranges. One, two and three year buds. This nursery has been operated since 1883 by G. H. Gibbons, Waverly, Fla.

THRIFTY TREES and budwood from record performance Perrine Lemon parents. Persian Lime and other citrus varieties. DeSoto Nurseries, DeSoto City, Fla.

STANDARD varieties of citrus trees including Persian limes and Perrine lemons at reasonable prices. Ward's Nursery, Avon Park, Fla.

THOUSANDS of Rough Lemon Seedings, six to twenty inches high. $1.50 per hundred; $12.50 per thousand; ten thousand or more at $10.00 per thousand. Strong field grown plants. INDIAN ROCK NURSERIES, Largo, Florida.

Very desirable buds on sour orange root. Valencias, Hamlins and Jaffas. Also sour orange seedlings. Prices on request. Nursery at Blanton, Fla. Copothorn Groves, Inc., "Bob Thornton" and "Rox Pollard". P. O. Box 310, Tampa.

CAUSERIENCE LEPIDOFLOIA—(So-called Brazilian oak), resembles Australian pine. Grand for wind-breaks. Cold resistant. Beautiful. Send for sample of foliage. $6.00 per 100. S. S. Matthews, Homestead, Fla.

HARDIN'S SPERRYOLA Lemon, a profitable adapted commercial variety for all sections. Hardy, prolific grower and producer. Limited number choice trees. Hardin Nurseries, Box 63, Lakeland, Fla.

CITRUS NURSERY TREES, standard and new varieties on Cleopatra and Sour. Priced from $8c up. Grand Island Nurseries, Eustis, Fla.

SEED—Rough lemon, sour orange, cleopatra. New crop from type true parent trees. Also thrifty seedlings. DeSoto Nurseries, DeSoto City, Florida.

NEW COMMERCIAL lemon for Florida, the Perrine; proven. All residents need yard trees, keeping Florida money at home. Booking orders for budded stock for Winter delivery. DeSoto Nurseries, DeSoto City, Fla.

CITRUS SEEDLINGS, all root stock varieties. $10.00 per 1000 up. Grand Island Nurseries, Eustis, Fla.

BUDDED trees new Florida commercial lemon, proven, thin skinned, juicy, scab immune. Also rough lemon, sour orange and Cleopatra seed and liningout seedlings. DeSoto Nurseries, DeSoto City, Fla.

WANTED—To hear from owner having good farm for sale. Cash price, particulars. John Black, Chippewa Falls, Wisconsin.

CROTALARIA SPECTABILIS, fresh crop, scarified, $15.00 per 100 lbs. F. O. B. Eustis. GRAND ISLAND NURSERIES, EUSTIS, FLA.

PERSONAL

QUIT TOBACCO easily, inexpensively, without drugs. Send address. Ezra Stokes, Mohawk, Florida.

ALYCE CLOVER, the best legume for hay or covercrop. Write for information. Hardin Groves, Box 63, Lakeland, Fla.

UP to $20.00 paid for Indian Head Cents; Half Cents $125.00; Large Copper Cents $500.00, etc. Send dime for list. Romanocoinshop, D. Springfield, Mass.

FOR SALE—Small packing house machinery and equipment complete. Apply Hector Supply Company, Miami.

CROTALARIA SPECTABILIS — Fresh crop, $15.00 per 100 lbs. f. o. b. Frostproof, Fla. Milton Woodley, Frostproof, Flo.

FOR SALE—Practically new 25 gal. capacity Hardie super mogul sprayer equipped with 14 h. p. 4 cy. Novo engine, 500 gal. tank mounted on Chev. chassis with dual wheels, ten ply tires. Sprayer used equivalent to one season. Perfect condition. Sprayer cost new $1050 plus present value truck $450. Will sacrifice all for $750 or will trade for smaller sprayer and difference. C. O. Reiff, Marianna, Fla.

Better Growers Use Our Planned Production Program. Designed for your grove. Soil analysis and interpretations. Sound, Safe, Profitable. J. G. LAWTON, Research Chemist, Bartow, Fla., Phone 8804.

"MAIL ORDER Operator desires contact with grower of high grade avocado pears. Have interesting proposition for grower of highest quality fruit." F. R. Gardner, P. O. Box 528, Greenville, Pa.

ROSE BUSHES — Guaranteed 2-Yr. old fieldgrown everblooming varieties. Fall planting best. Free catalog. Tytex Rose Nurseries, Tyler, Texas.

CITRUS TREES — Offer about 100 Valencia orange trees, 2 to 2¾ in. caliper, 75c; 150 Duncan grapefruit, 2 to 3½ in. caliper, 65c. On sour stock delivered your truck here. J. K. Christian, McIntosh, Fla. Marion County.

The Growers' Own Page

This department is devoted to the growers, for their use in giving expression to their views and a discussion of growers' problems. Any grower is welcome to make use of this department for the discussion of topics of interest. The only requirements are that the articles must be on some subject of general interest, must be reasonably short and must be free from personalities. The editor assumes no responsibility for views expressed, nor does publication imply endorsement of the conclusions presented.

WANTS AID FOR GROWERS

McIntosh, Fla., June 21, 1938.

Editor The Citrus Industry:

I see by the papers that the government is to help the railroads. I think we citrus and vegetable growers have helped them enough and it is about time the government was helping the citrus and vegetable growers, as they are the only class who have not been helped, and they are certainly going in the red fast.

I have been in the citrus game since 1880 and conditions since that date have not been as bad as now. The citrus industry is in a deplorable condition. We are told daily what we can do and what we can't do — also rates are going up each year.

Take the railroad employes, federal and state employes, they feel no depression. Why? They are paid by the "people" who make the government and it seems it is about time the citrus and vegetable growers woke up. Seems as though it might be better to turn republicans than to let such conditions exist in our industry.

George L. Norsworthy.

NEW SYSTEM OF IRRIGATION SUGGESTED

Oakland, Florida, May 31, 1938.

Mr. S. L. Frisbie, Editor,
The Citrus Industry,
Bartow, Fla.

Dear Mr. Frisbie:

I am sending this information, describing a new method of watering old trees along to you thnking that it will be of value and interest to your readers.

As you know the customary method of watering old trees is to pull the dirt away from the trunk — thus making a basin around and near to the trunk and pouring the water into this basin.

At the Seminole Groves in Pinellas County recently they had been watering trees in this manner for days without any results whereas the second day after they changed to a method I suggested the trees came out of a very severe wilt.

The block of trees was orginally set 25 by 25 but some years ago the rows were interplanted so that now the branches overlap. Both the old trees and the large interplants were badly wilted.

New basins were made between the trees in the tree row. Half way between the trees, in the tree row, a basin approximately six feet long and two and one-half feet wide was

(Continued on Page 7)

1. Skinner, B.C. 2. Citrus Concentrate Plant

B. C. Skinner's Concentrate Plant Uses Large Quantities of Juice Fruit

Another decided asset to the citrus industry in Florida is to be found in the citrus concentrate plant designed, built and operated under the direction of B. C. Skinner at Dunedin.

During the chief operating season of this plant from 1500 to 2000 boxes of oranges and grapefruit pass through the plant each day, which serves not only to approximate the amount of concentrate produced, but provides a market for much fruit which otherwise would have difficulty in being marketed.

In addition to the orange and grapefruit concentrates which are now being produced the company is now experimenting on pineapples in an effort to evolve a suitable concentrate from this fruit.

One of the principal advantages of the Skinner method of producing concentrates is that the juice is extracted at low temperature and the water is removed by a vaccuum process which enables the juice to retain its food elements and vitamin content. So successful has the process been, indeed, that it has been accepted by the American Medical Association.

A large percentage of the product is sold to dairymen throughout the north who prepare it for consumption and distribute it as they do their milk products. Large quantities of the concentrate are also used by hospitals, hotels and clubs.

Evidence of its merit was disclosed in a test recently made in Jacksonville when 2000 persons participated in a contest in which a $100 prize was offered to the person who could correctely determine which was the natural orange juice and which was the concentrate product out of a given number of samples. Although the concentrate contained only 50 per cent as much actual orange juice as the natural product, not a single person was able to correctly distinguish between the two, from the various samples tested.

STATE PLANT BOARD SERVES THE PUBLIC IN EXPOSING FAKES

Although incidental to its official duties, the State Plant Board has investigated various "discoveries" from time to time and exposed them as frauds, thereby saving Florida farmers and other citizens thousands of dollars they might have thrown away on these things.